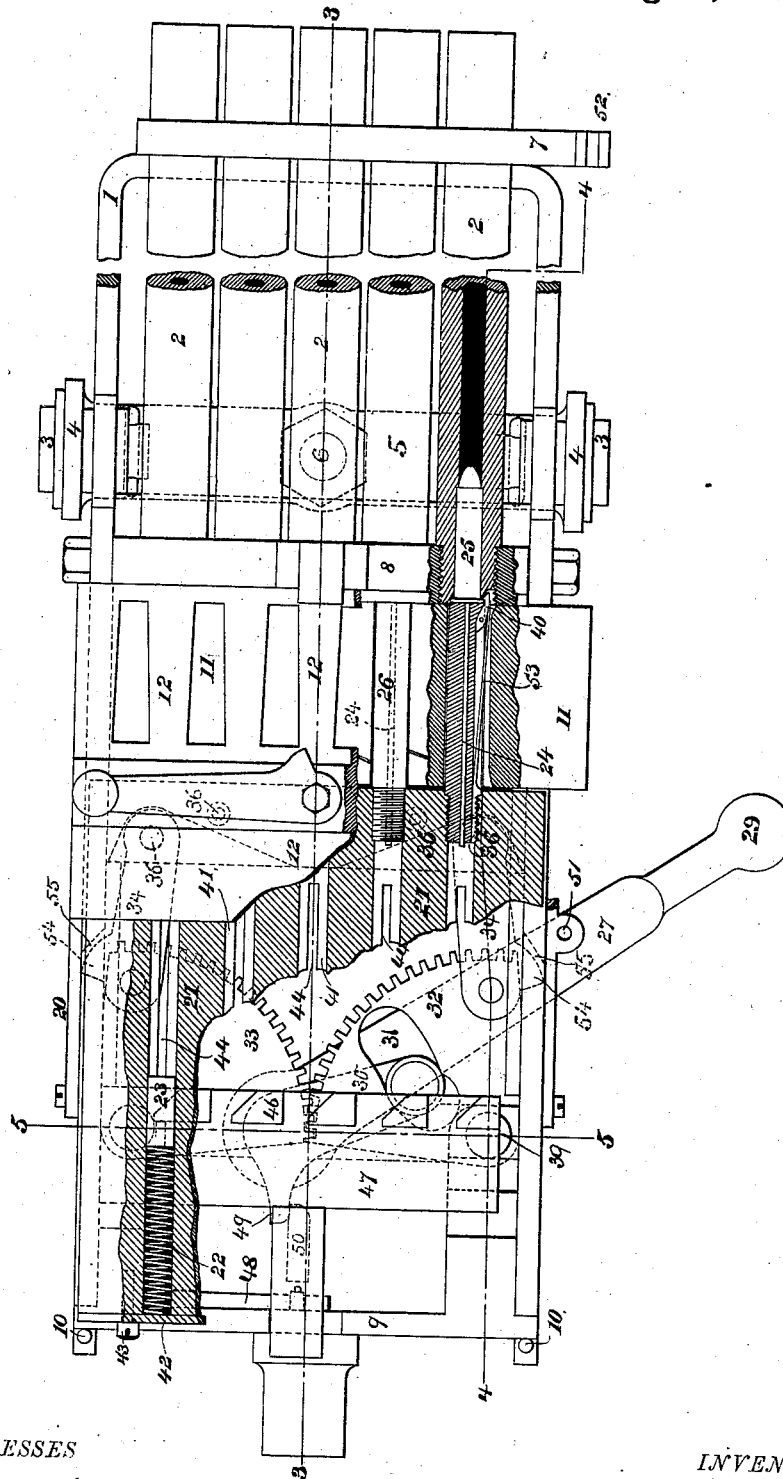


H. PALMCRANTZ.  
Machine-Gun.

No. 218,190.

Patented Aug. 5, 1879.

Fig 1.



WITNESSES

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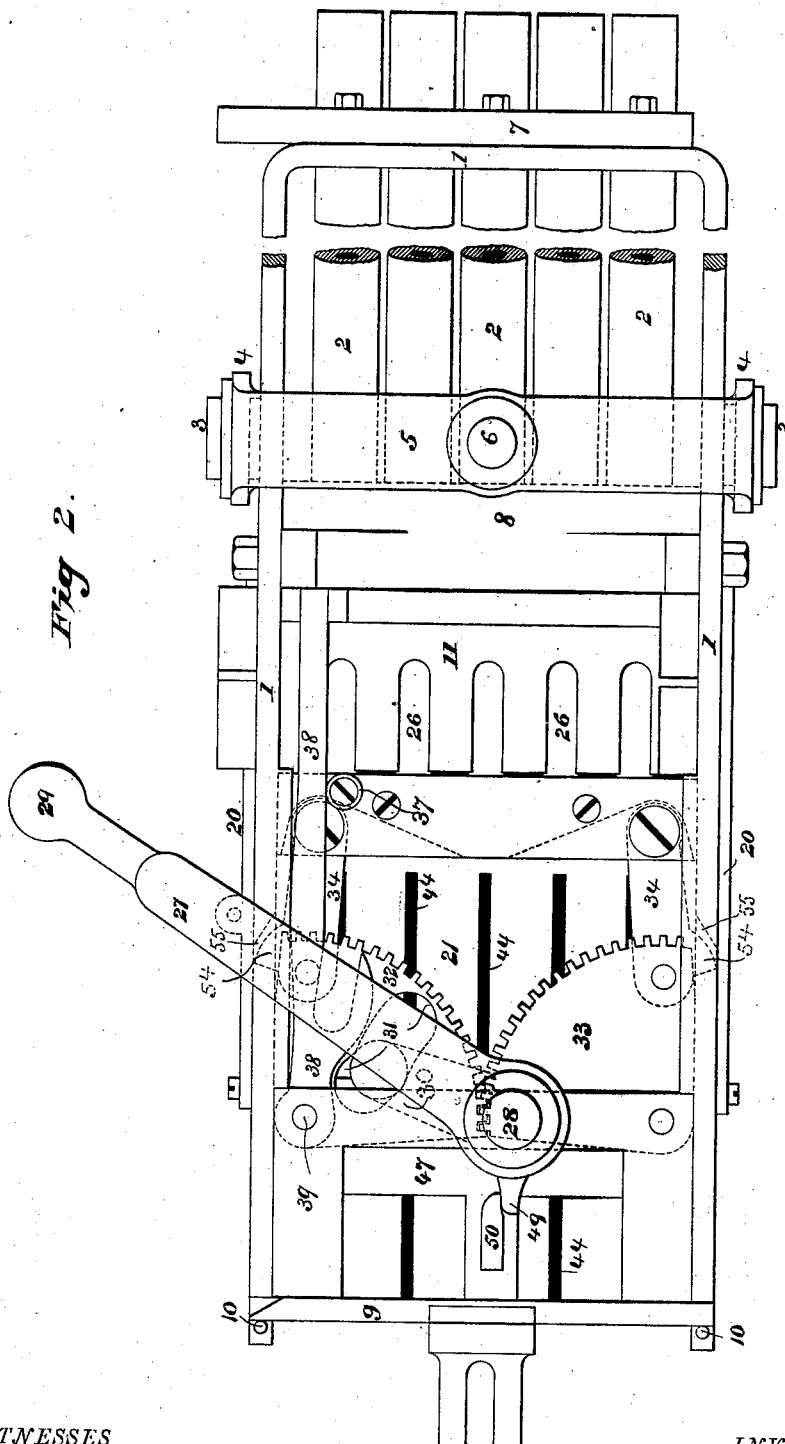


Fig 2.

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Fig 3.

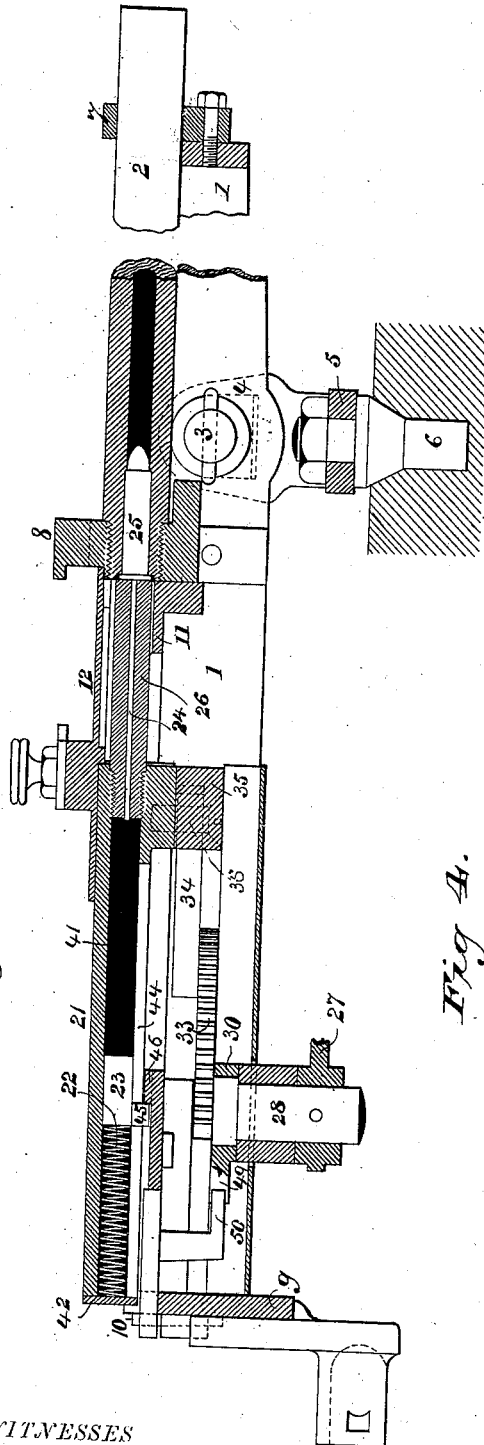
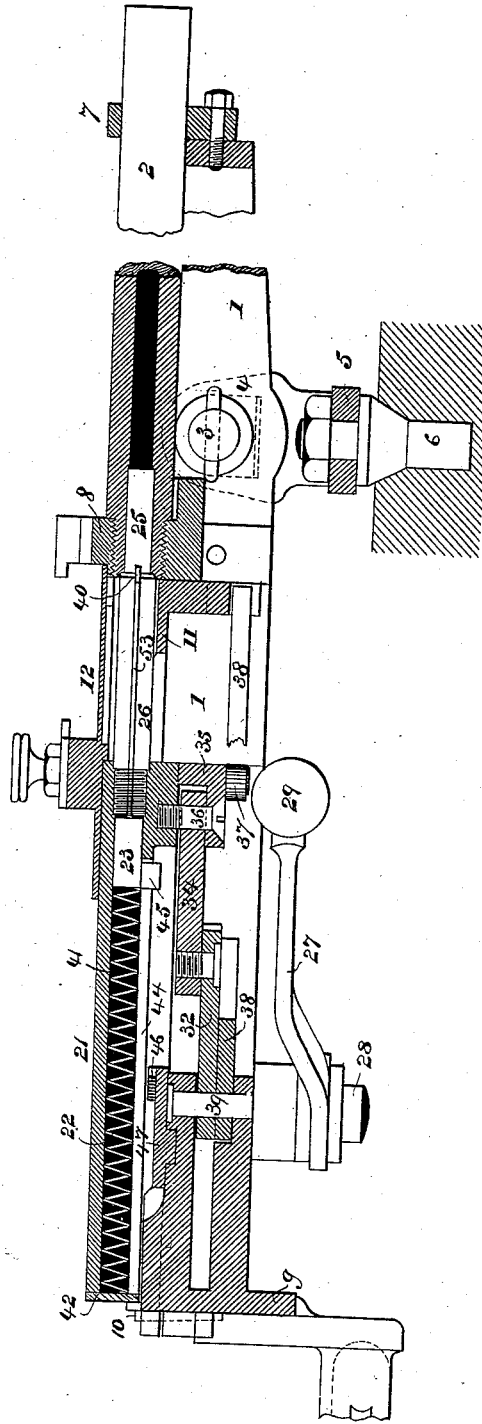


Fig 4.



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Fig 5.

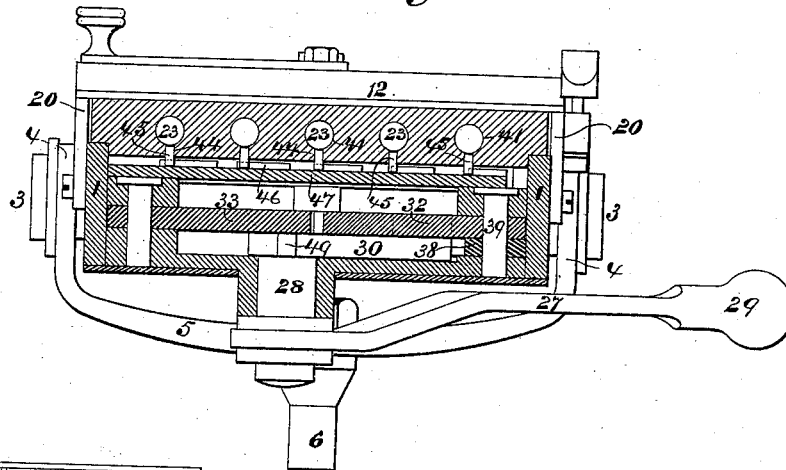


Fig 6.

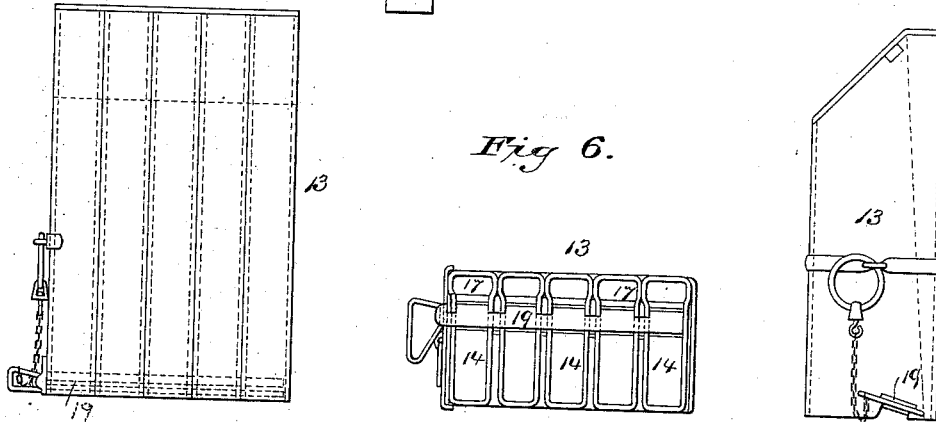
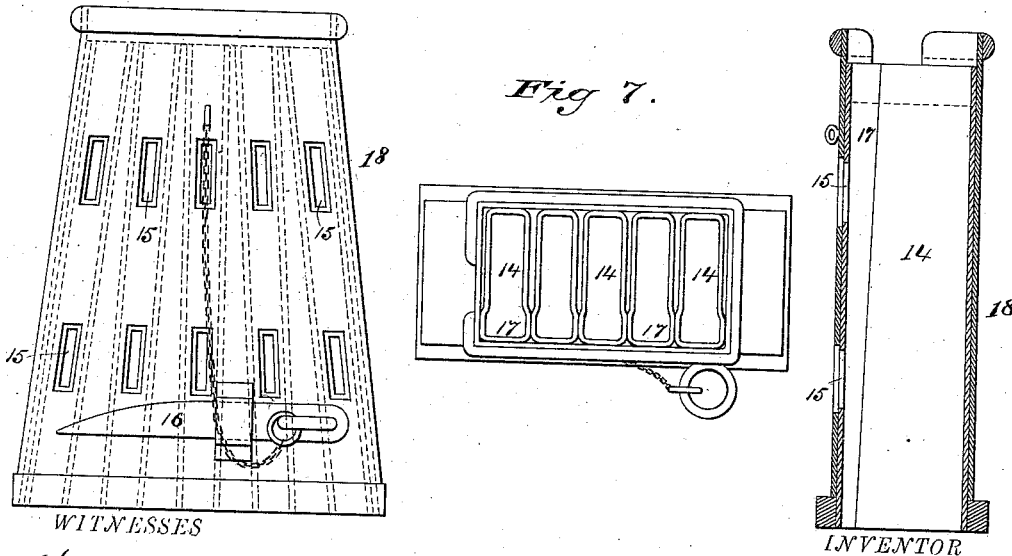


Fig 7.



WITNESSES

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# UNITED STATES PATENT OFFICE

HELGE PALMCRAANTZ, OF STOCKHOLM, SWEDEN, ASSIGNOR TO THORSTEN NORDENFELT, OF LONDON, ENGLAND.

## IMPROVEMENT IN MACHINE-GUNS.

Specification forming part of Letters Patent No. **218,190**, dated August 5, 1879; application filed January 21, 1879; patented in England, September 17, 1878.

*To all whom it may concern:*

Be it known that I, HELGE PALMCRAANTZ, of Stockholm, in the Kingdom of Sweden, civil engineer, have invented new and useful Improvements in Battery-Guns, which improvements are fully set forth in the following specification, reference being had to the accompanying drawings.

The object of this invention, which is illustrated by drawings annexed, is to provide improved means by which two or more barrels of any given caliber can be put together in a frame, with a mechanism which causes these barrels to be loaded with cartridges, and the cartridges to be fired and extracted by the action of the mechanism when moved by the gunner.

Figure 1 is a plan view, partly in section. Fig. 2 is a bottom view. Fig. 3 is a longitudinal section on the line 3 3 of Fig. 1. Fig. 4 is a longitudinal section on the line 4 4 of Fig. 1. Fig. 5 is a transverse section on the line 5 5 of Fig. 1, and Figs. 6 and 7 are detail views of the permanent and supplemental magazines.

The nature of this invention is as follows: A frame, 1, holds the barrels 2 fixed in a horizontal plane, one at the side of the other, and it also carries the mechanism behind the chamber ends. It is not necessary that the barrels should be ranged in a straight line. They might be ranged in the arc of a circle. The frame hangs upon two trunnions, 3, round which it can be turned to give elevation and depression to the battery-gun. The trunnions rest in bearings 4 on a cross head or bar, 5, capable of swiveling on a central vertical pivot, 6, which for naval or for field purposes may be dropped into a gun-carriage or gun-bed to allow of lateral aim being given to the battery-gun to the right or left of the gunwale or field-carriage upon which it is placed. The frame has three cross-pieces, the foremost of which, 7, holds the muzzles of the barrels, while the breech ends of the barrels are screwed into the middle cross-piece, 8. The rear cross-piece, 9, is fitted on to the rear end of the frame, and held to it by screws or wedges 10.

At the breech end of the barrels, and resting upon the frame at both sides, is what is called a "carrier-block," 11, which has a to-

and-fro movement given to it transversely of the frame. The carrier-block has cut in it a number of grooves or openings equal to the number of barrels in the battery-gun. Into each opening a cartridge can be dropped, and then by a subsequent movement of the carrier-block be brought into a line with the barrels, in order that the cartridges may be pushed forward into them.

*Supply of ammunition.*—The ammunition is previously put into a hopper, which can be single or double, and which is placed on the lid of the mechanism above the carrier-block, close up to the breech ends of the barrels, and is held into its position by a clasp on the said lid. The hopper has a channel for cartridges corresponding to each barrel in the battery-gun. The channels 14 are at the side of one another, and in the same relation to one another as to line as the breech ends of the barrels, so that each column of cartridges has the bullets toward the barrels and the percussion-caps toward the rear. The hopper can hold any desired number of cartridges, (I prefer ten for each barrel when a single hopper is used, and twenty or thirty for a double hopper,) and when the hopper is once in position the cartridges fall of their own weight into the corresponding grooves in the carrier-block without the hopper or cartridges being turned or touched in any way. The hopper can have open slits 15 toward the rear, so that the gunner can always see how much ammunition he has in the hopper, and so that he can correct, with a spike or nail, 16, provided for this purpose, any cartridges which may not have fallen properly within the hoppers. The rims of the cartridges are guided by a groove, 17, within each channel, the shape of which groove is decided by the shape of the cartridge-case in such a manner that the groove by guiding the rim of the cartridge-case forces the cartridge to enter the mechanism in the desired position.

The single hopper is as above described, and with a sliding lid at the bottom, which prevents the cartridges from falling out when the hopper is carried by its handle, but which sliding lid is held back by a catch on the lid when the hopper is pushed into position, so as to

leave the channels open and to allow the cartridges to fall into the carrier-block.

The single hopper has to be lifted off when all the cartridges are fired, and replaced by a loaded hopper.

The double hopper consists of a lower part, called "cartridge-distributor," 18, which is placed empty upon the lid in the manner above described. It is open at both the upper and the lower ends, and it can be narrower at its upper end, as its lower end is wide enough to enable the cartridges to enter the mechanism in corresponding positions to the openings in the carrier-block and to the chamber ends of the barrels.

The upper part of the double hopper is called the "magazine," or the "hopper proper," 13. It contains the desired number of cartridges in the same way as is described for the single hopper, except that instead of the sliding lid the cartridges are held by a bar, 19, which is withdrawn by hand as soon as a magazine is placed in position above the distributor. When this bar is withdrawn the cartridges fall from each channel of the magazine into the corresponding openings of the distributor.

As soon as a magazine proper is emptied it can be at once replaced by a loaded magazine, so that the firing can be absolutely continuous without being interrupted by change of hoppers, as the gunner fires from the supply of cartridges in the distributor during the time required for changing (upper) magazines proper.

The lid 12, which covers the mechanism, has open holes, through which the cartridges fall from the hopper into the carrier-block 11, and there are guiders fixed on the lower side of the lid which hold the cartridges in position while they enter and are moved by the carrier-block. The lid is held to the frame by two bars, 20, the ends of which move round pins, so that the lid can be raised in order to lay open the mechanism, which is then free and can be lifted out of the frame.

In rear of the carrier-block is a block called a "spring-box," 21, as it carries the springs 22, by which the hammers 23 are propelled forward, and cause the strikers 24 to explode the cartridges 25. This block has given to it a to-and-fro movement in a direction lengthwise of the barrels. Projecting from the forward part of the block are breech-pins 26, one for each barrel. When the block is moved forward these push forward the cartridges which are lying in the carrier-block, and cause them to enter the breech ends of the barrels.

Within each breech-pin or breech-block is a striker, 24, which is driven forward when a cartridge in front of it is to be exploded by means of a striking-hammer, 23. The striking-hammers move in a line with the strikers, and are pressed forward by springs 22, carried by the spring-box 21.

The action of the several parts results from a forward-and-backward movement being given to a lever or firing-handle, 27, which

turns on a pin or pivot, 28, fixed to the frame or rear cross-piece, 9, underneath or within the mechanism proper.

The end 29 of the firing-handle 27, which reaches outside the frame, is held by the gunner. The other end, 30, which is bent to the desired angle, acts within a cam-slot, 31, which is cut into a segmental piece, 32, moving round its center, and with teeth or cogs cut along its circumference, which teeth act upon similar teeth cut into a similar segmental piece, 33, placed in a reversed position at the opposite side of the frame. By the movement of the firing-handle 27, these two segments thus receive a forward-and-backward motion, which is transferred by means of two driving bars or links, 34, to a driving-block, 35, and thence to the spring-box 21, by a single or double set of pins, 36, two of which are fixed to the driving-block and the other two to the spring-box.

*The loading.*—As the driving-block is moved forward and backward a friction-roller, 37, upon it at the end of each backward and at the beginning of each forward motion acts upon a bent bar, 38, which at one end turns on a fixed center, 39, and at the other enters into a groove on lower side of the carrier-block, and gives to the carrier-block 11 its transverse to-and-fro movement. When the carrier-block moves to the side a layer of cartridges, one for each barrel, falls from the hopper through the lid into openings cut in the carrier-block in such a way that when the carrier-block returns these cartridges are moved exactly in a line with the barrels, so that the breech-pins, which are screwed into the front of the spring-box, which acts as a breech-block common to all the barrels, can push them through the said openings into the chambers, where the breech-pins support the whole of the cartridges until all of them have been fired. The carrier-block remains in the same position until the extractors 40 fixed to the breech-pins have drawn out the empty cartridge-cases through the said openings, after which, when the firing-handle is near its rearmost position, the carrier-block again moves to the side to fetch a fresh layer of cartridges.

The loading can also be done by hand, if required, by simply dropping a layer of cartridges into the lid and carrier-block after each volley has been fired.

*The firing.*—The above-mentioned breech-pins 26 are screwed into the part of the spring-box 21 which acts as breech-block in the exact lines of the center lines of the barrels, and each breech-pin holds within it, concentrically, (or for rim-firing cartridges along its outside,) the striker 24, which is to fire the percussion-cap with its point, which protrudes slightly in front of the breech-pin. The rear ends of the strikers, which are level with the rear ends of the breech pins, are acted upon by the striking-hammers 23, supported by and acted upon by the spiral springs 22. The hammers with their spiral springs run within round holes or channels 41 bored out lengthwise in the spring-

box, also in a line with the center lines of the strikers and of the barrels. The rear ends of the spiral springs are supported by a sliding bar, 42, at the rear end of the spring-box, which bar can be lifted by loosening one of the screws 43 holding it, when all the spiral springs, the hammers, and the strikers can be taken out without opening up the mechanism proper.

Each hole or channel has on its lower side a slit, 44, lengthwise, through which protrudes the heel 45 of the hammer 23, the one side of which is beveled to fit and to act upon studs 46 on a sliding bar, which I call the "trigger-comb," 47.

This trigger-comb is a bar placed upon bearings at each side of and within the rear part of the frame or on the rear cross-piece, at right angles to the barrels, and has a number of studs, one for each barrel on its surface.

When the spring-box is drawn back by the firing-handle, the heels 45 of the hammers 23 force the trigger-comb 47 to one side, just enough to allow the heels of the hammers to slip behind the studs 46. As soon as the heels have thus passed through the trigger-comb is forced back into its original position by a spring, 48, acting by an angle upon the trigger-comb, which prevents the hammers from again passing forward until the trigger-comb is moved.

When the spring-box is again moved forward the hammers are thus held back, and the spiral springs are compressed until, after the cartridges are within their chambers and the breeches are closed, a short lever, 49, on the inner end of the firing-handle begins to act upon a vertical knee, 50, attached to the trigger-comb, and moves the trigger-comb again to the side.

The studs 46 of the trigger-comb 47 then pass in front of the hammer-heels 45, and as the studs are of varying width (each stud being slightly wider than the stud on its side next to it) one hammer, 23, is released at a time, the spiral spring 22 presses it forward until it gives a blow to its striker 24, and the shots are thus fired, one after the other, which causes less recoil than if they were fired all at the same moment. When the firing-handle again moves backward the trigger-comb is pushed back by the before-mentioned spring and angle into position for again catching the hammers for the next volley. Back-sights 51 and fore-sights 52 are provided on one or both sides of the barrels, so that the eyes can always be kept in the alignment of the aim whether the gun is served by one or two gunners.

*The half-cock.*—On the rear cross-piece is fixed a catch with a handle to it, which can be moved into such a position that it acts upon a leg or stud fixed to the trigger-comb in such a way that it counteracts the force of the above-mentioned angle and spring, and thus keeps the trigger-comb steady in its position farthest to one side when the studs of the

trigger-comb do not touch the heels of the hammers, which thus pass freely in and out through the trigger-comb. Thus the springs are not compressed, and no cartridges can be fired, although they can at this half-cock position be passed through the mechanism and the chambers and again extracted without their percussion-caps being struck. By again releasing the hold of the half-cock catch upon the trigger-comb the mechanism again is and remains at full-cock.

*The extraction.*—Each breech-pin 26 has one or two extractors, 40, each consisting of the hook 40 (extractor proper) and the spring 53. The hook is fixed into the breech-pin by a pin, around which it moves, guided by a slot, the hook protruding sufficiently to catch the rim of the cartridge-case when the cartridge is within the chamber and the breech closed. The spring acts with its one end freely on the back of the hook, pressing it inward, and the other end of the spring fits into a slot near the base of the breech-pin, so that the extractor-spring is screwed in at the same time as the breech-pin, and is held in position by the breech-block. After all the barrels have been fired, the breech-pins 26 draw the extractor-hooks 40 backward, and all the empty cartridge-cases are extracted through the openings of the carrier-block 11 until the rims of the cartridge-cases pass outside the carrier-block, when the empty cases fall through; and the release of the empty cases is further assisted by the movement to the one side of the carrier-blocks 11, which actually forces the rims of the empty cases away from the extractor-hooks 40, and prevents the possibility of jamming. The extractors cannot release the cartridge-cases which they have begun to withdraw until the proper time, the grooves in the carrier-box in which the extractors lie being so formed as not to allow premature movement of the extractor.

The recoil is resisted by the breech-pins 26 and by the weight of the entire spring-box 21, and the two or four pins or bolts 36, which connect the spring-box with the driving-block 35, carry the recoil on to the remainder of the mechanism.

In order to prevent the possibility of any damage from the recoil, the links 34, which push the driving-block forward, are brought in a straight line, so as to support the driving-block 35, before the cartridges can be fired; and, further, these links 34 have knees or bends 54, which enter recesses 55 in the sides of the frame before the cartridges are fired, so that the recoil of the firing is actually resisted by the strength and weight of the entire frame.

The firing-handle can be fixed by a clasp in one position, thus giving still further security against mishaps, in addition to the half-cock.

A plate can be screwed to the frame underneath the mechanism, in order to prevent too much dust entering the mechanism. Holes can be provided wherever required for greasing the moving parts of the mechanism by the use of an oil-can.

*Resumé of action.*—When a charged hopper, 13, is placed in position, nothing more is required than to move the firing-handle 27 forward and backward as far as it will go in each direction. If moved rapidly, the gun will give a rapid succession of volleys. If moved more slowly, a rapid succession of single shots will be discharged.

When the firing-handle 27 is in its most rearward position the carrier-block 11 is in its position to the one side where it receives a fresh layer of cartridges. During the motion forward of the firing-handle 27 the spring-box 21 follows the forward movement, and the following actions of the mechanism take place in succession. The carrier-block 11 moves back into its regular position, and thus carries a layer of cartridges each in a line with the rear of the corresponding barrel 2. The studs 46 on the trigger-comb 47 meanwhile retain the heels 45 of the striking-hammers 23, so that the spiral springs 22 become compressed by the forward motion of the spring-box 21. The breech-pins 26 push the cartridges into the chambers and support the bases of the cartridges. The extractor-hooks 40 catch the rims of the cartridges 25. The bends or knees 54 of the driving-links 34 enter the sides of the frame 1 and act as recoil-bolts. The lever or stud 49 on the inner part of the firing-handle 27, then, while the other parts remain at rest, moves the trigger-comb 47 slowly to one side, so that the varying width of the studs on the trigger-comb releases one hammer 23 after another, which is thus sent forward by its spiral spring 22 until it causes the striker 24 to fire the percussion-cap of each cartridge 25.

During the motion backward of the firing-handle 27 the following actions of the mechanism take place: The bends or knees 54 of the driving-links 34, which act as recoil-bolts, are withdrawn from out of the sides of the frame 1. The backward movement of the spring-box 21 causes the extractors 40 to extract the empty cartridge-cases all at the same time until the rims have arrived outside the rear of the openings in the carrier-block 11, when the side motion of this carrier-block pushes the empty case out of the hold of the

extractor-hook 40, and the case falls through the aperture in the carrier-block 11. The heels 45 of the hammers 23 act upon the studs 46 and push the trigger-comb 47 to the one side enough to allow the heels to pass through, after which the angle and spring 48 force the trigger-comb back into position, so that the studs of the trigger-comb are in front of the hammer-heels, and thus hold them back, when the spring-box 21 is again to move forward. The friction-roller 37 on the driving-block 35 forces the bent bar 38, which acts upon the carrier-block 11, to the one side, so that the apertures in the carrier-block come directly underneath the channels in the hopper, out of which a fresh layer of cartridges thus drop into the carrier-block ready for being moved in rear of the barrels when the spring-box again moves forward.

Having thus described the nature of the said invention and the manner of performing the same, I would have it understood that I do not confine myself to the exact details described, and that the form of the parts may be varied without departing from the invention. Indeed, as will be readily understood, it is necessary that the barrels, the breech-pins, the extractors, the strikers, and some other parts should be adapted to the ammunition which the gun is intended to carry, and these necessary adaptations will be well understood by the gun-maker.

I would also remark that some of the features of this gun form the subject of another application, and are not claimed by me in this specification; but

What I do now claim is—

1. The combination of the firing-handle 27, the two segmental pieces 32 and 33, the former having cam-slot 31, the driving-bars 34, and the driving-block 35, substantially as described.

2. The combination, with the frame having recesses 55, of the driving-bars 34, having knees 54, and the spring-box, whereby the recoil is resisted, substantially as described.

HELGE PALMCRAVITZ.

Witnesses:

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